Lower Limb Amputation in the Veterans Health Administration 1989 to 1998

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Forward

TheVA Center of Excellence for Limb Loss Prevention and Prosthetics Engineering is pleased to provide you this 10 year summary of lower extremity amputations performed in VHA facilities. As you well know, amputations are a serious problem for older veterans. The major risks for amputation include advancing age, diabetes, peripheral vascular disease, ulcers, and infection.

We found that the age-specific amputation rates in VHA facilities are higher than US rates, in part because of the poor health of the VHA population. However, the number of amputations and age-specific amputation rates, which adjusts for the increase in veterans using VHA facilities, declined by about 5% each year. During the same time period, the number of diabetic amputations remained stable. We should be proud of our collective efforts to decrease the amputation burden on veterans.

We also present VISN-specific rates of amputation for 1989-1998. We found a three-fold difference in amputation rates across the VISNs. The reasons for this difference are not known, but in the future we hope to identify the factors associated with the low rates and relay this information to the rest of the VHA. Amputation rates for each facility are also available.

We trust that this information will be of use to you and your staff.

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Why Do Veterans Undergo Lower Extremity Amputation?

Hospital discharge data from all Veterans Health Administration (VHA) hospitals were analyzed for this monograph using the Patient Treatment File. Amputations of the lower extremity from the toe to hip were identified using the discharge diagnosis codes ICD-9-CM 84.11 to 84.19. Between FY 1989 and 1998, 70,200 amputation procedures were performed during 60,324 hospitalizations on 44,007 veterans. All data reported in this monograph are analyzed by hospital discharge except for page 15 which reports data by amputation procedure.

The primary indication for the amputation obtained from the discharge diagnosis codes was assigned in heirarchical fashion to only one category. The categories were defined as a) atherosclerotic peripheral vascular disease alone, b) diabetes with or without vascular disease, c) major trauma, d) cancer e) miscellaneous or unspecified conditions. The most frequent primary indication for amputation was diabetes, 62.9%, followed by atherosclerotic peripheral vascular disease, 23.6%, then miscellaneous conditions which included venous stasis ulcers in persons without diabetes or peripheral vascular disease, 11.7%. Infrequent causes of amputation were major trauma, 1.4%, and cancer, 0.4%.

Table 1: Number of hospital discharges with lower extremity amputation by year and primary indication for amputation, VHA, 1989 to 1998

	Indication					
Year	Athero-sclerotic vascular disease	Diabetes	Major Trauma	Cancer	Misc	Total
1989	1721	3816	120	33	895	6585
1990	1692	3951	102	21	810	6576
1991	1492	3663	104	28	734	6021
1992	1431	3593	84	19	667	5794
1993	1467	3856	80	23	706	6130
1994	1406	3915	100	20	655	6096
1994	1406	3915	100	20	655	6096
1995	1388	3920	68	21	700	6097
1996	1301	4065	95	12	579	6052
1997	1223	3665	55	18	683	5644
1998	1135	3481	61	22	630	5329
Total	14,256	37,923	869	217	7,059	60,324

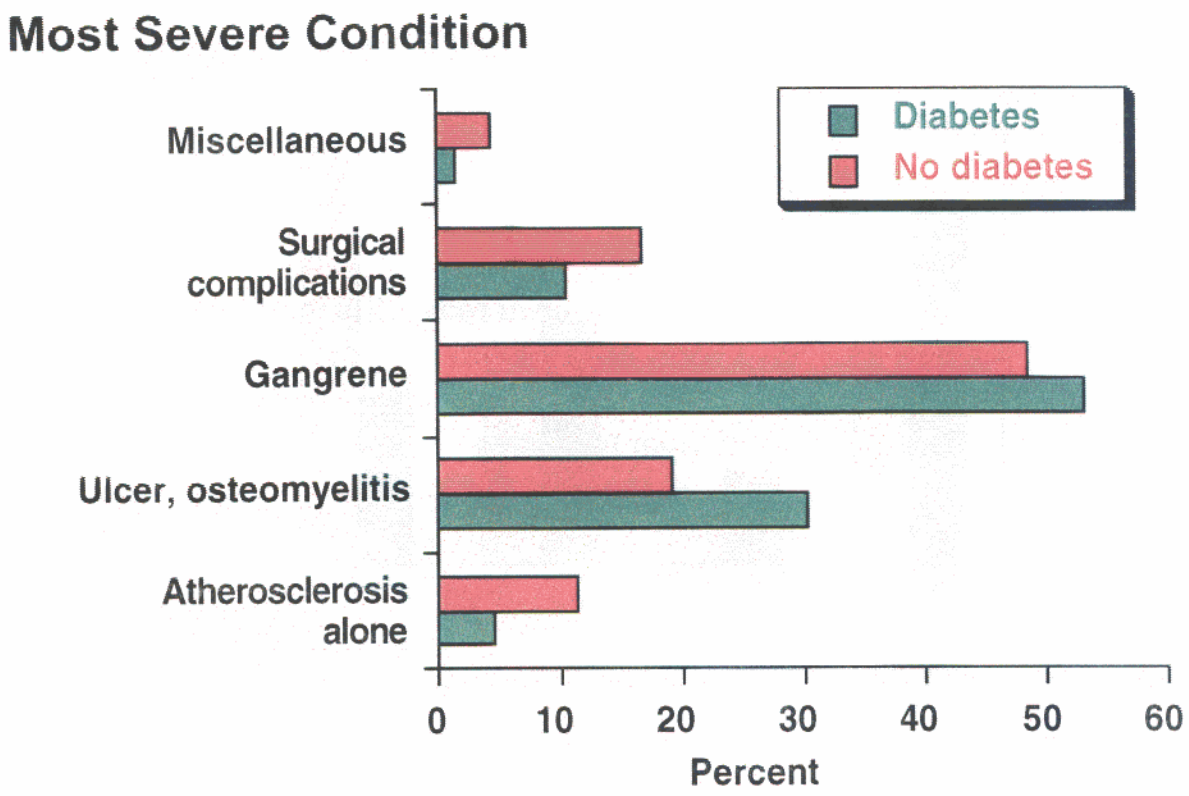

Figure 1. Most severe condition leading to amputation by diabetes status, VHA, 1989 to 1998. Amputations due to cancer and major trauma have been excluded.

Veterans often have multiple conditions leading to amputation. For example, half of the persons with diabetic amputation also had peripheral vascular disease. To better understand the conditions leading to amputation, we identified all the conditions from the discharge diagnosis codes and assigned each amputation discharge to the most severe condition. The categories, in order of severity, were a) atherosclerosis alone (i.e. rest pain and claudication only); b) ulcer, infection, or osteomyelitis; c) gangrene (included both vascular and non-specific gangrene); d) complications from vascular or orthopedic surgery; and e) miscellaneous conditions. For example, a veteran who had atherosclerosis, infected ulcer, and gangrene would be coded by the most severe condition of gangrene.

The most severe condition associated with amputationis shown by diabetes status in Figure 1. The most severe condition leading to amputation for those with diabetes were atherosclerosis alone, 5%, ulcer or osteomyelitis 30%, gangrene 53%, and surgical complication, 11%, while for those without diabetes the conditions were atherosclerosis alone 11%, ulcer or osteomyelitis, 19%, gangrene 49%, and surgical complication 17%.

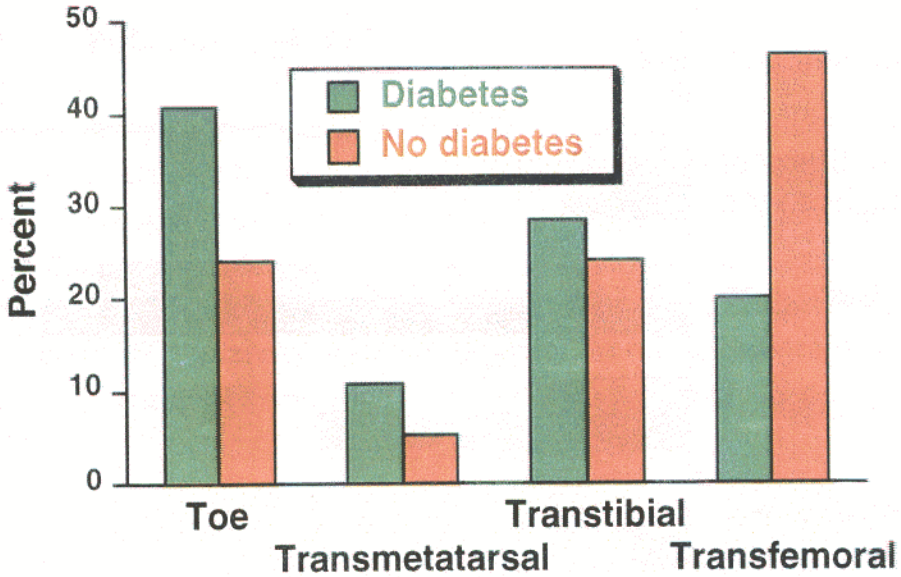

Figure 2: Highest amputation level during hospitalization by diabetes status, VHA, 1989 to 1998. Excludes amputations due to major trauma and cancer.

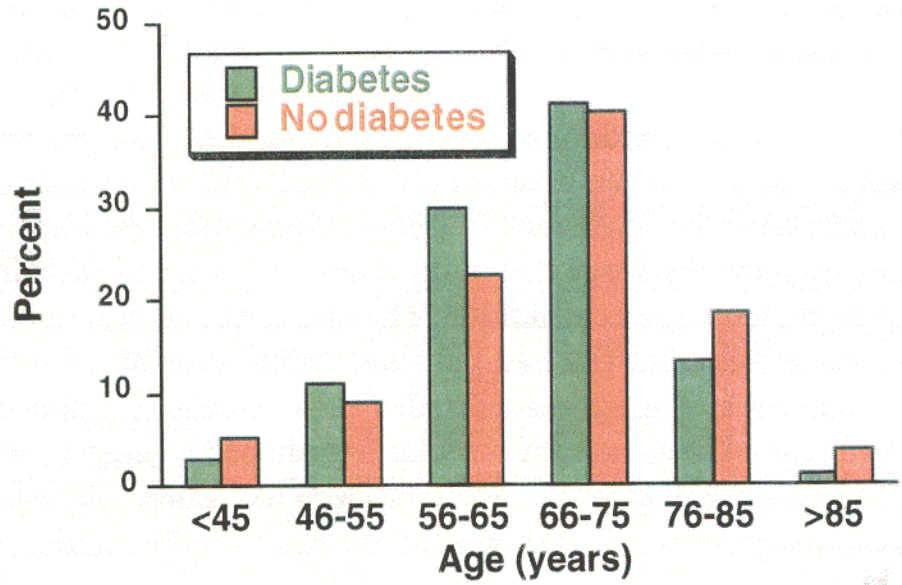

Figure 3: Age distribution of hospital discharges with amputation by diabetes status, VHA, 1989 to 1998. Excludes amputations due to major trauma and cancer.

Comparison of Amputation Level and Demographic Features by Diabetes Status

Diabetes strongly influences the amputation level as shown in Figure 2. Persons with diabetes are more likely to have amputation of the toe (41% vs 24%) or at the transmetatarsal level (11% vs 5%) when compared to persons without diabetes. They are somewhat more likely to have a transtibial amputation (29% vs 24%), and much less likely to have a transfemoral amputation (20 vs 46%) as compared to persons without diabetes. Overall, almost 30% of hospital discharges with a lower extremity amputation had an amputation at the transfemoral level, approximately a quarter were at the transtibial level, and 44% were at the transmetatarsal or toe level.

The demographic features varied less by diabetes status. The age at amputation ranged from 26 to 106 years of age with a mean age of 64 years for both groups. Over 40% of the amputations occurred to veterans between the ages of 65 and 74 years. The age distribution by diabetes status is displayed in Figure 3.

The racial distribution and marital status did not vary significantly by diabetes status (data not shown). Twenty-four percent of the discharges were African American, 63.1% were White, and 12.8% were of other or unspecified race. Approximately half of all amputees were married. . Over 99% of the amputees were male so no analysis by sex was possible.

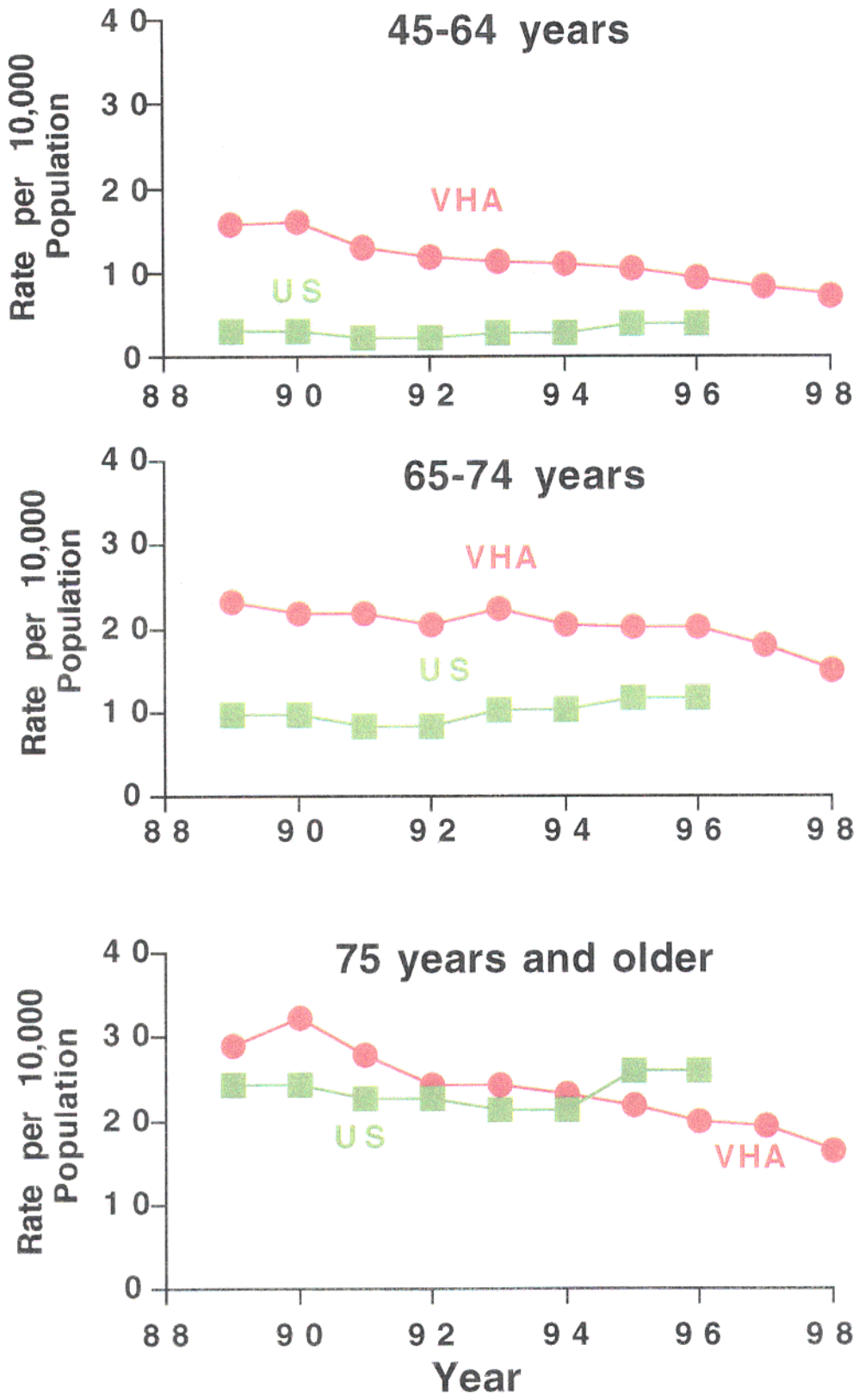

Figure 4: Age-specific rates of major amputation (transtibial and transfemoral amputations), VHA, 1989 to 1998 and United States (U.S.) male rates, 1988 to 1996. No U.S. data is available for 1997 and 1998.

Trends in VHA Major Amputation Rates

Major amputation includes amputation at the ankle (i.e. Syme amputation), transtibial, and transfemoral level. Major amputations usually require prosthesis and extensive rehabilitation and are associated with increased morbidity and mortality.

Age-specific major amputation rates for VHA facilities are compared to rates for males in United States (U.S.) hospitals in Figure 4. Amputation rates for veterans 45 to 64 years of age were almost three times greater than the rate in the U.S. population, but the rate steadily decreased over the decade. Amputation rates for veterans 65 to 74 years of age were approximately double the rate in the U.S. male population, but the VHA rates declined steadily over the last 10 years, while the U.S. rate increased slightly. Amputation rates for veterans 75 years and older in the VHA were similar to rates in the general U.S. population.

Between 1989 and 1998, the number of veterans using VHA services (veterans with one or more ambulatory visits or inpatient hospitalization) increased by an average of 63,231 veterans per year. Age-specific amputation rates adjust for these changes in the population at risk and provide a more accurate reflection of amputation risk for different age groups. We used the VHA user population to calculate the age-specific rate.

The reasons for higher rates in the VHA population as compared to the U.S. male population are not known, but several explanations are possible. The U.S. rates were estimated from the National Hospital Discharge Survey which does not include amputations from VHA facilities in the numerator but includes veterans in the denominator. This would result in an estimated amputation rate that is approximately 10% lower than the true rate for the United States. Also, there is some evidence that the veterans who use VHA services are sicker and have more risk factors for amputation as compared to the general US population. It is also possible that the recent changes in registration and recruitment efforts may have artifically swelled our estimates of the VHA user population.

Trends in minor amputation rates

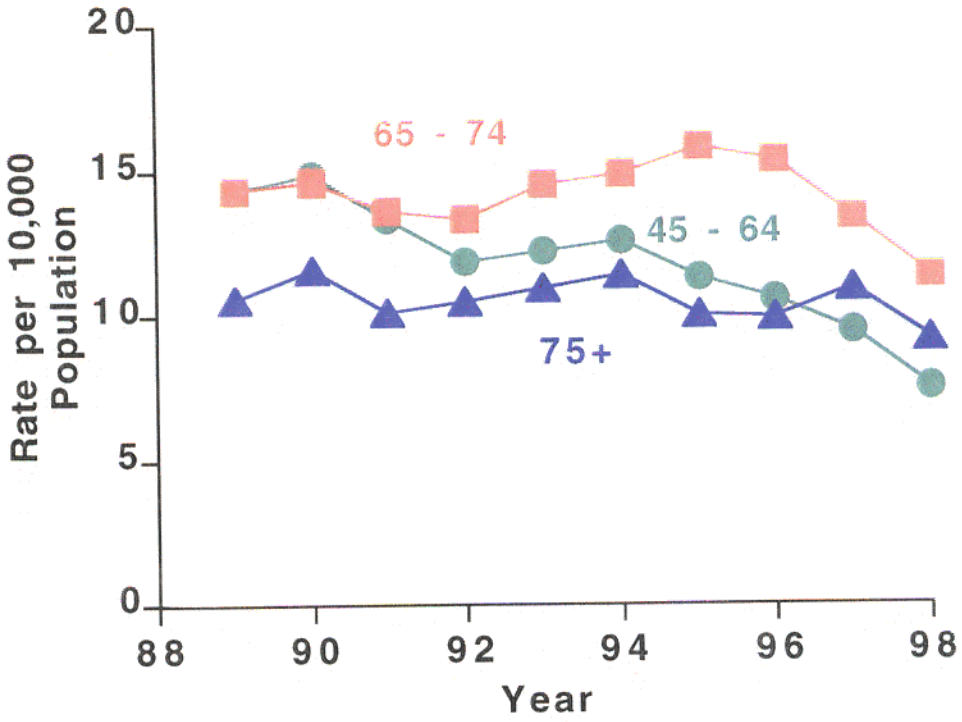

Figure 5: Age-specific amputation rates of minor amputation, VHA, 1989 to 1998

Minor amputations involve the toe, transmetatarsal level, or other portion of the foot. Amputations at this level generally do not require extensive prosthesis or rehabilitation and are associated with a reduced risk of mortality as compared to major amputations.

The trends in age-specific rates depicted in Figure 5 suggest a different pattern as compared to the major amputation rates. Veteran 65 to 74 years of age had the highest rate of minor amputation as compared to the older (age 75 years and older) and younger (age 45 to 64 years) age group. The amputation rate declined dramatically for the 45 to 64 years of age group over the last 10 years, while the amputation rate increased briefly for those in the 65 to 74 years of age group. Minor amputation rates in veterans 75 years and older remained fairly stable over the last 10 years.

Trends in total amputation rates

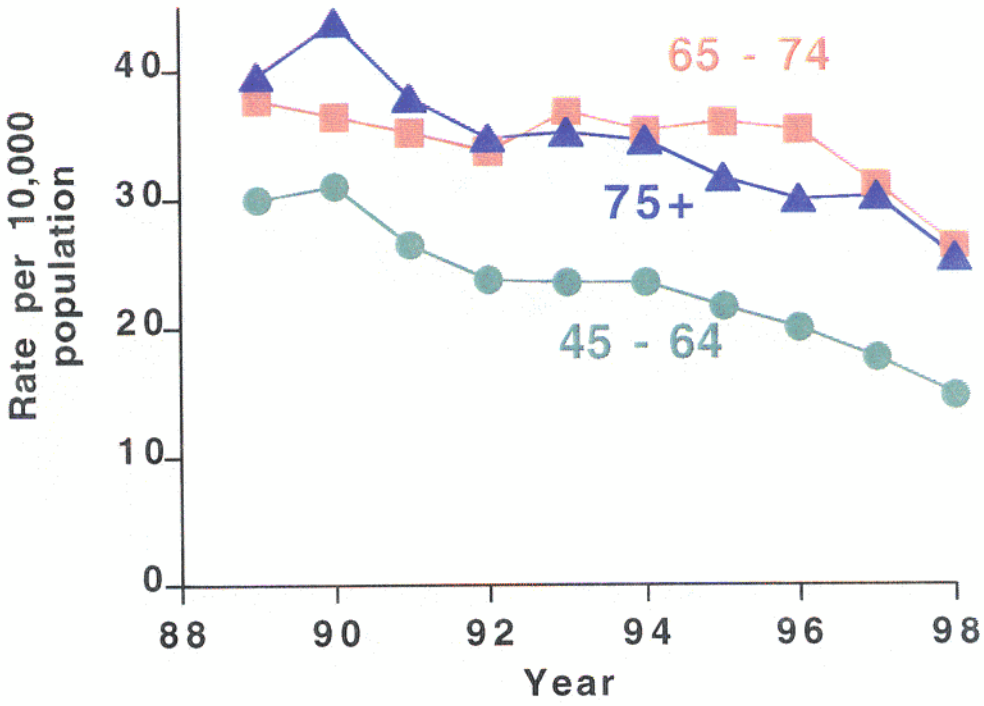

Figure 6: Age-specific amputation rates for all lower extremity amputations

The age-specific rates for total (i.e. major and minor) lower extremity amputations are shown in Figure 6. The different pattern for major and minor amputation rates for veterans 64-75 years and 75 years and older canceled each other out when combined. This results in similar total amputation rates for both age groups. The youngest age group, 45 to 64 years of age, had the lowest total amputation rate and experienced the most rapid decline in amputation rate of the three age groups.

Trends in amputations by diabetes status

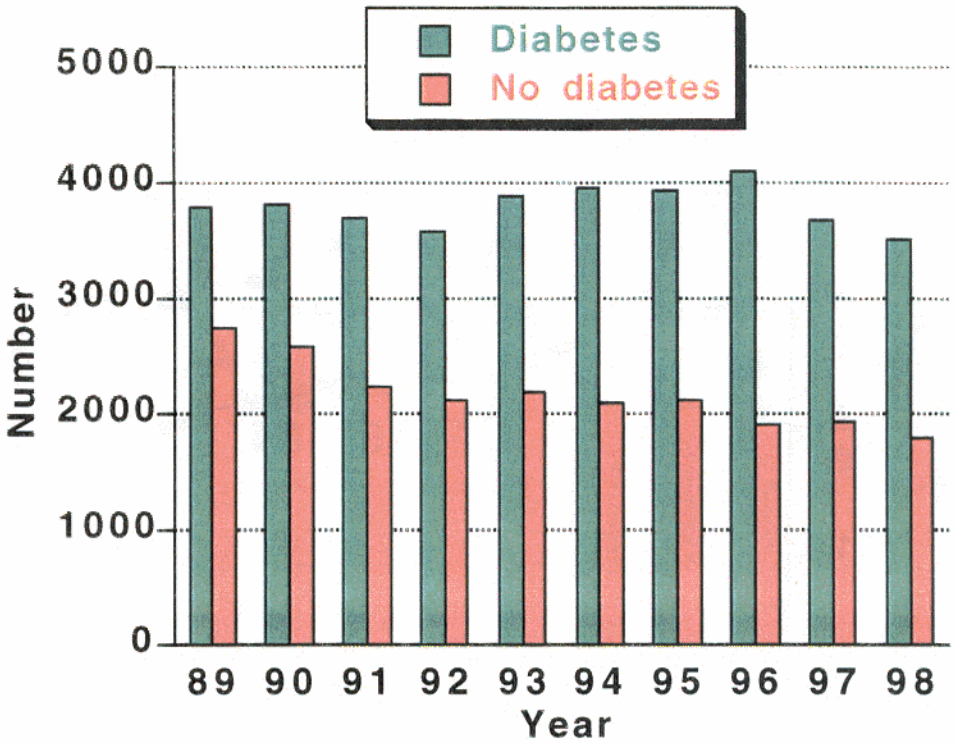

Figure 7: Number of discharges with lower extremity amputation by diabetes status, VHA 1989=1998

The total number of amputations for those with and without diabetes between 1989 and 1998 is shown in Figure 7. The total number of amputations decreased by an average of 80 amputations per year while the diabetic amputations decreased by only 12 procedures per year

The proportion of all VHA amputations associated with diabetes was almost 66% in 1998, which isconsiderably greater than the 50% rate reported for the general US population. The reasons for this higher rate of diabetic amputations compared to the U.S. are not known but may reflect that the higher prevalence of diabetes in the VHA compared to the general population (17% vs 8%). The proportion of amputations associated with diabetes has increased from 59% in 1989 to 66% in 1998 as shown in Figure 8. Thischange reflects the decrease in non-diabetic amputations. It is also possible that VHA providers now screen and code for diabetes more aggressively, which would shift persons from the non-diabetes group to the diabetes group.

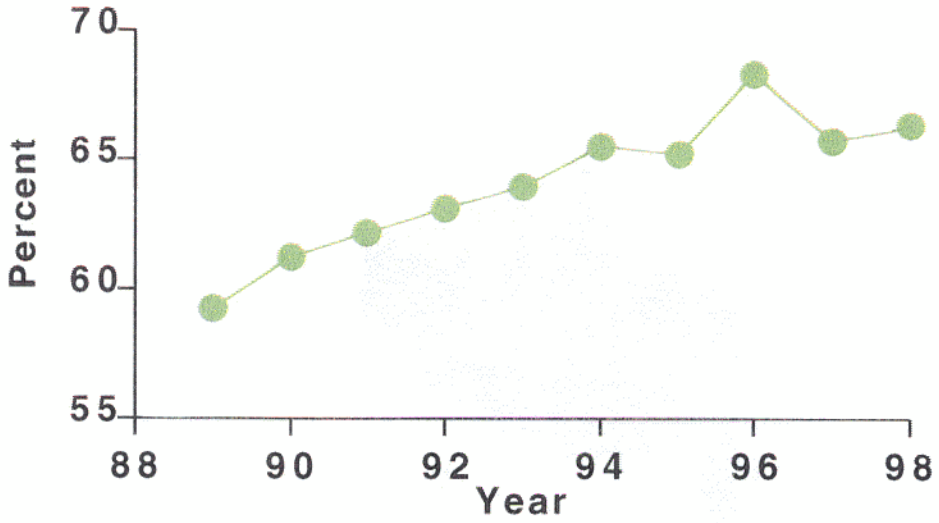

Figure 8. Percent of amputation discharges associated with diabetes, VHA, 1989 to 1998.

The age-specific rates per diabetic population are compared to US rates in Figure 9. The diabetes denominator was defined as any veteran with three or more outpatient visits and at least one of those visits with a diabetes diagnosis code (ICD-9-CM 250.x). The age-specific VHA rates (1998) were compared with the most recent rates (1996) for the U.S. population (men and women). The US rates include both males and females and were calculated from the National Hospital Discharge Survey by the Division of Diabetes Control, Centers for Disease Control. VHA diabetic amputation rates were slightly lower in each age group than the US rates.

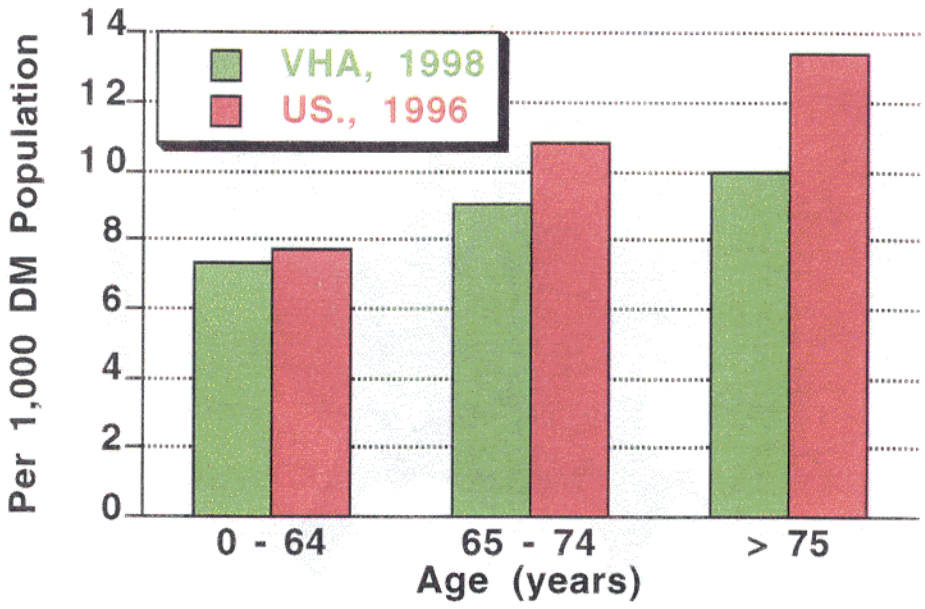

Figure 9. Comparison of VHA and US age-specific diabetic amputation rates per diabetic population

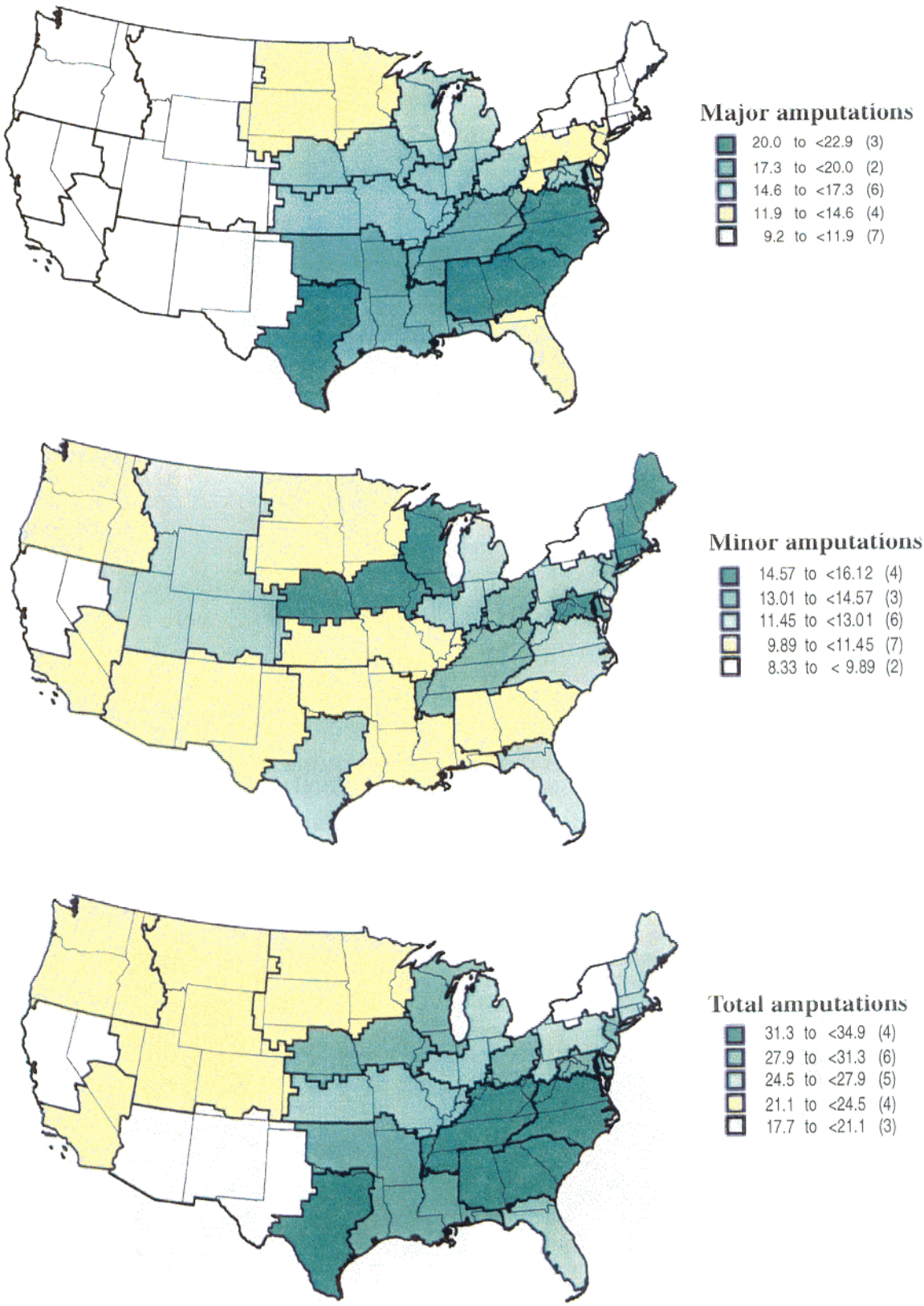

Figure10: Amputation rate by VISN for major, minor and total amputations, VHA, 1989 to 1998.

Geographic variations

The age-adjusted* amputation rate for each Veterans Integrated Service Network (VISN) was calculated for major, minor, and total amputation. The distribution of these rates is compared geographically in Figure 10. Higher rates for major amputation were noted in the South, while higher rates of minor amputation were noted in New England, mid-Atlantic and the upper Midwest. The age-adjusted rate for each VISN is provided in Table 2.

Table 2: Age-adjusted* amputation rate for major, minor, total amputation rate by VISN, VHA 1989-1998 (rate per 10,000 population)

VISN	Major amputation	Minor amputation	Total amputation
1	11.7	16.0	27.7
2	9.5	8.3	17.8
3	13.7	14.4	28.1
4	14.5	12.2	26.7
5	14.8	14.6	29.4
6	22.8	12.0	34.8
7	21.8	11.2	33.0
8	14.1	12.8	26.9
9	19.8	14.0	33.8
10	14.9	14.6	29.4
11	15.9	11.9	27.7
12	14.9	16.1	31.0
13	12.9	10.2	23.2
14	15.7	14.6	30.3
15	14.9	11.4	26.3
16	19.1	10.3	29.5
17	20.5	12.3	32.8
18	10.2	10.0	20.2
19	10.6	12.7	23.3
20	11.7	10.7	22.4
21	9.2	9.7	18.9
22	11.6	10.1	21.7
Total	15.1	12.2	27.3

*Adjusted to 1990 male population > 45 years of age

Trends in multiple amputations during the same hospitalization

Approximately 15% of all veterans discharged with an amputation undergo two ore more amputation procedures during the same hospitalization. The rate of repeat amputations differs by diabetes status, as shown in Figure 11, and is declining for both persons with and without diabetes. We also analyzed stump revisions, defined as a surgical revision of an amputation at the same level. These also showed a steady decline over the 10 years (data not shown). The decline in repeat procedures and stump revisions suggests that surgeons have become more efficient at deciding the appropriate amputation level and managing post-operative complications that lead to repeat amputation at a higher level.

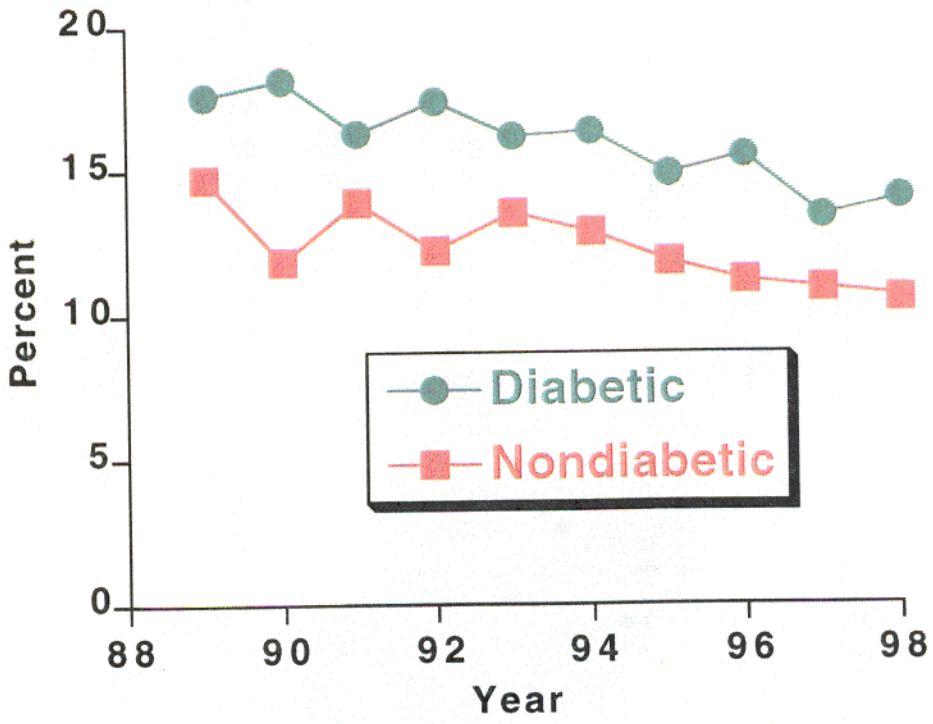

Figure 11: Percent of amputation hospitalizations with two or more amputations during the same hospitalization by diabetes status, VHA, 1989-1998.

Surgical specialty performing the amputation

The trends in the specialty of the primary surgeon performing the amputation procedure is depicted in Figure 12. The number of operations performed by general surgery service declined steadily between 1989 and 1998 while the number performed by vascular surgery increased slightly. This data reflects the total number of operations rather than just hospitalizations.

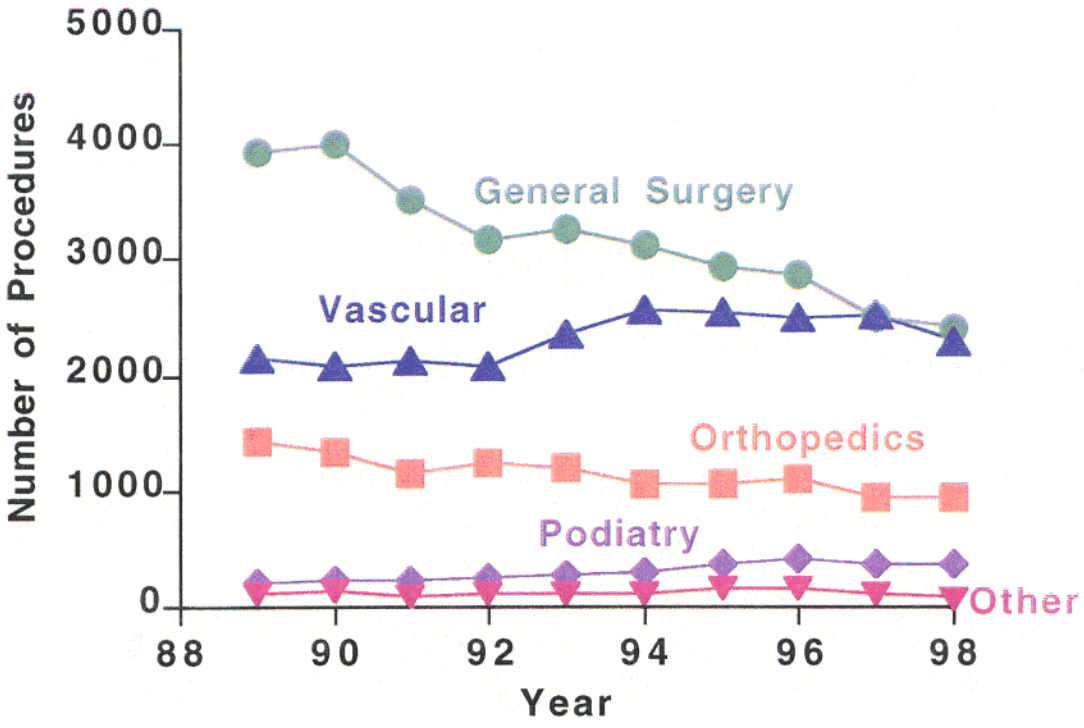

Figure 12: Trends in surgical specialty performing the amputation, VHA, 1989 to 1998

Mortality following amputation

Mortality was calculated for all those who underwent an amputation in 1992 except those with trauma or cancer. Amputation level was associated with significant differences in the short-term and long-term mortality rates. The 30-day mortality rate was 1.8% for toe amputation, 3.1% for transmetatarsal amputation, 8.0% for transtibial amputation, and 12% for transfemoral amputation. Over sixteen percent of the persons undergoing transfemoral amputation died before discharge, as compared to 6% of transtibial amputations, 4% of transmetatarsal amputations, and 2% of toe amputations. The long term survival following amputation by amputation level is shown in Figure 13.

Figure 13: Survival following amputation by the first amputation level performed in 1992, VHA.